

CLAIMS

1. A battery comprising:
a battery case defining an interior volume; and
an electrode assembly mounted in said interior volume, said electrode
5 assembly comprising:
a plurality of planar elements including a plurality of positive electrodes, a
plurality of negative electrodes, and a plurality of separators;
each of said positive electrodes comprising a metal substrate having a
peripheral edge defining an active area and a tab extending from
10 said active area, said active area defining front and rear faces each
bearing a layer of positive active material;
each of said positive electrode tabs defining front and rear faces each
having a metal reinforcing strip attached thereto;
each of said negative electrodes comprising a metal substrate having a
15 peripheral edge defining an active area and a tab extending from
said active area, said active area defining front and rear faces each
bearing a layer of negative active material;
each of said negative electrode tabs defining front and rear faces having
a metal reinforcing strip attached thereto;
20 each of said separators having a peripheral edge defining a primary area
and a tab extending from said primary area; and wherein
said plurality of planar elements are arranged in a stack comprising a
sequence of alternating positive and negative electrodes having a
separator interposed between adjacent electrodes and wherein said
25 positive electrode tabs are aligned to form a positive tab column and
said negative electrode tabs are aligned to form a negative tab
column spaced from said positive tab column.

2. The battery of claim 1 including a plurality of clips each comprising an integral metal piece having first and second portions bent around a foldline; and wherein

5 each of said clips is mounted on an electrode tab with said clip first and second portions respectively engaging said tab front and rear faces to form said metal reinforcing strips.

3. The battery of claim 2 wherein each clip on said positive electrode tabs is sufficiently thick to abut a clip on an adjacent tab along said positive tab column; and wherein

10 each clip on said negative electrode tabs is sufficiently thick to abut a clip on an adjacent tab along said negative tab column.

4. The battery of claim 2 wherein each of said clips has spaced first and second alignment holes extending through the first and second portions thereof and the electrode tab therebetween.

15 5. The battery of claim 2 wherein each of said clips is trimmed to define a reference edge; and wherein

 each of said clips has spaced first and second alignment holes referenced to said reference edge extending through said first and second clip portions and the tab therebetween.

20 6. The battery of claim 4 wherein said alignment holes are circular.

7. The battery of claim 4 wherein said alignment holes are noncircular.

8. The battery of claim 4 further including registration pins extending through said alignment holes.

9. The battery of claim 1 including a plurality of clips each comprising an integral metal piece having first and second portions bent to define an interior foldline and an exterior foldline; and wherein

5 each of said clips is mounted on an electrode tab with said clip first and second portions respectively engaging said tab front and rear faces to form said metal reinforcing strips and with said clip interior foldline positioned adjacent to a tab outer edge.

10 10. The battery of claim 9 wherein each clip on said positive electrode tabs is sufficiently thick to abut a clip on an adjacent tab along said positive tab column; and wherein

 each clip on said negative electrode tabs is sufficiently thick to abut a clip on an adjacent tab along said negative tab column.

15 11. The battery of claim 10 wherein all of said clips on said positive electrode tabs are welded together; and wherein all of said clips on said negative electrode tabs are welded together.

20 12. The battery of claim 10 wherein each of said clips defines an opening extending from said interior foldline to said exterior foldline to expose a portion of a tab therethrough; and wherein said clips on said positive electrode tabs and the tab portions exposed therethrough are welded together; and said clips on said negative electrode tabs and the tab portions exposed tab portions exposed therethrough are all welded together.

25 13. The battery of claim 1 wherein each separator in said stack has a tab bridging the spacing between the tab on an adjacent positive electrode and the tab on an adjacent negative electrode.

14. The battery of claim 1 wherein each of said positive electrode tabs and reinforcing strips attached thereto have first and second spaced alignment holes extending therethrough; and wherein

5 said positive electrode tab alignment holes are precisely aligned in said stack
to form said positive tab column; and wherein
each of said negative electrode tabs and reinforcing strips attached thereto
have third and fourth spaced alignment holes extending therethrough;
and wherein
said negative electrode tab alignment holes are precisely aligned in said
10 stack to form said negative tab column.

15. The battery of claim 14 further including registration pins extending through said first, second, third, and fourth alignment holes.

16. The battery of claim 14 wherein each separator in said stack has a tab having fifth and sixth alignment holes extending therethrough; and wherein
15 each separator tab bridges the spacing between tabs on adjacent positive
and negative electrodes; and wherein
said tab fifth and sixth alignment holes are respectively aligned with said
positive tab second alignment hole and said negative tab third alignment
hole.

20 17. The battery of claim 16 wherein each separator tab is compressed
between adjacent reinforcing strips on tabs in said positive tab column and
between adjacent reinforcing strips on tabs in said negative tab column.

18. The battery of claim 1 wherein each of said metal substrates has a thickness within a range of 5 to 30 microns and each of said active material
25 layers has a thickness within a range of 30 to 120 microns.

19. The battery of claim 18 wherein each of said separators has a thickness within a range of 20 to 30 microns.

20. The battery of claim 19 wherein the reinforcing strips on each positive electrode tab are sufficiently thick to abut reinforcing strips on an adjacent positive electrode tab in said stack; and wherein
 5 the reinforcing strips on each negative electrode tab are sufficiently thick to abut reinforcing strips on an adjacent negative electrode tab in said stack.

21. A battery including:
 10 an electrode assembly comprising a stack of planar elements including a plurality of alternately arranged positive electrodes and negative electrodes and wherein said stack includes means for separating adjacent electrodes;
 each of said electrodes including a substrate defining an active area and a
 15 tab extending therefrom;
 each of said tabs having a first reinforcing strip secured to a front face thereof and a second reinforcing strip secured to a rear face thereof;
 said tabs of said positive electrodes in said stack being aligned to form a positive tab column;
 20 said tabs of said negative electrodes in said stack being aligned to form a negative tab column extending parallel to and displaced from said positive tab column; and wherein
 said positive electrode tab reinforcing strips are all welded together and said negative electrode tab reinforcing strips are all welded together.

22. A method of fabricating an electrode assembly comprising:
 25 forming a plurality of positive electrodes each including a substrate defining a substrate active area and a tab extending from said active area, and

- wherein said substrate active area has positive active material on front and rear faces thereof;
- forming a plurality of negative electrodes each including a substrate defining a substrate active area and a tab extending from said active area, and
- 5 wherein said substrate active area has negative active material on front and rear faces thereof;
- securing first and second reinforcing strips to the front and rear faces of each of said tabs;
- forming first and second alignment holes through each of said tabs and said
- 10 reinforcing strips secured thereto;
- alternately stacking said positive and negative electrodes together with separators interposed between adjacent electrodes to align positive electrode tabs along a first column and negative electrode tabs along a second column;
- 15 welding together said reinforcing strips secured to said positive electrode tabs; and
- welding together said reinforcing strips secured to said negative electrode tabs.